Productivity and Firms' Sale Destination: Chinese Characteristics

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Abstract

In the trade literature, it is often assumed that there are no or little trade costs within a country's border, though large trade costs across a country's border. So the more productive firms self-select into exporters, and the less productive firms serve domestic consumers due to cost saving. This paper presents a similar but different case in China thanks to the large trade costs within China. Domestic Chinese markets are segmented by provincial borders, due to the various (hidden) protective measures favoring local firms. These discriminative measures are de facto trade barriers and have hindered firms' efforts to sell outside their home provinces. This paper applies the heterogeneous trade theory to examine the effects of firms' productivity on their sales choices both in the international markets and outside their home provinces in China. We find that more productive firms not only self-select into exporters, but also into sales in other provincial markets. This pattern is sensitive to firms' locations and firms' ownerships. For FDI-controlled firms, increases in productivity are associated with higher probability of selling into other provincial markets, but not into exports.

Key words: trade costs, domestic market segmentation, export, productivity

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1. Introduction

A rich literature in international trade has found that only more productive firms self-select into exporters due to trade costs across borders—this is the essence of the heterogeneous firm theory in international trade, formally developed by Melitz (2003) and Helpman et al. (2004). Empirical studies, as early as Bernard and Jensen (1995), have provided numerous cases that showed a clear linkage between a firm's productivity and its export decision. These evidences are also documented in surveys by Wagner (2005), Greenaway and Kneller (2007) and Bernard et al. (2012).

Implicit in those studies is that a country's domestic market is an integrated market and thus sales in the domestic market involves less or no trade costs. So the less productive firms can still stay in business by serving domestic consumers due to the cost saving advantage. Such assumption is quite reasonable, since it's much harder to conduct international business than doing business in the home market. But, if a country's domestic market is not integrated, like the Chinese market segmented by its provincial borders, we would expect that productivity premium is also needed to enter other (domestic) provincial markets. If it is indeed the case, then productivity differences between domestic firms (with sales only in China) and exporters will be less dramatic as those commonly documented in the trade literature. Indeed, a couple studies have reported a productivity paradox in the Chinese context. Lu et al. (2009) use a survey data of China's manufacturing firms during 1998-2005 to examine the exporting behavior of foreign affiliates. They found that contrary to the self-selection hypothesis in the Melitz model, among foreign affiliates in China, exporters are less productive than non-exporters. Similarly, Lu (2010), using the same dataset of Chinese manufacturing firms' survey, concludes that Chinese exporters are on average less productive than non-exporters. Is there something special about firms operating in China? Is it because foreign firms follow a different path from the Melitz's predication or is it because domestic trading costs play an important role affecting firms' sales decisions, or is it both? This is what the paper aims to study.

This paper also takes on different approaches in comparing firm productivity and their sales destinations. We take note of firm heterogeneity even among domestic firms with different sales patterns within China, among foreign affiliates and among domestic firms and foreign affiliates. This differentiation builds on the facts of firms operating in China. On the one hand, foreign affiliates are very different from indigenous Chinese firms. Among other

differences commonly reported in the FDI literature, foreign affiliates in China enjoy the exporting channel through their parent firms, and further, a big percentage of foreign affiliates in China produce mainly for the foreign markets, either through ordinary exports or through processing exports. However, because of the provincial trade costs, it might be harder for foreign affiliates to break into domestic Chinese markets. On the other hand, indigenous Chinese firms are also very different between state-owned enterprises (SOEs) and private/collectively owned firms. SOEs might have special access to some resources, but at the same time, they have to carry some social functions too. To a large degree, the Melitz's predication is best fit for indigenous private firms operating in China, less so for foreign affiliates and for SOEs due to their special advantages either in the international market or within the domestic market. With the substantial domestic trade costs, the Chinese case provides an interesting example to see to what degree productivity premium is observed for different types of firms operating in China.

Trade costs associated with exports is well-documented by various scholars (for instance, Anderson and van Wincoop, 2004) and are, to a certain degree, measurable.[1] Many would wonder why there also exist substantial trade costs across the provincial borders, which has led to market segmentation within China. There are many reasons.[2] A popular view is that the low productivity of the government and the administrative procedures are the common causes for barriers to enter other local markets.[3] Besides the usual administrative procedures, in China, due to its unique political system, different levels of governments have enacted a series of covert protectionist measures and entry barriers. There are two fundamental and policy-oriented features to understand the source of China's domestic trade barrier and local protection: China's fiscal decentralization policy and its tax system. Fiscal decentralization, which has been a fundamental aspect of China's economic reform to a market economy, is an important

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[1] It is no surprise that administrative procedures bring in extra trade costs in international trade as well. In fact, in many cases, these administrative costs are quite large. For example, Djankov et al. (2006) find that trade volume will decrease by 1% given one more day increase required to clear the customs.

[2] Unlike in international trade, there are many factors that would ease the negative impacts of trade costs on firms' domestic sales: they speak the same language, share the same culture, and are under the same set of central regulations. Many studies have shown that the ease of communication, similar culture and same language have facilitated trade flows. For example, the importance of same language and linguistic linkage in promoting international trade has been widely supported (Rauch, 1999; Melitz, 2008). So, the productivity effects on firms' domestic sales are an empirical question.

[3] For instance, Djankov et al. (2010）looked at the procedures for registering a new firm in 85 countries, and find that government productivity has a significant impact on registering new firms.

source of interregional protection within China. Under the planned economy, China ran a highly centralized fiscal management system. Starting in 1978, in order to get various levels of governments to be fiscally responsible, China has made substantial efforts to break down the centralized fiscal management system with various forms of fiscal contracting systems and tax sharing system (Shen et al. 2012). While such reform of fiscal decentralization has substantially prompted China's rapid regional economic growth (Zhang and Zou, 1998; Jing and Zou, 2005), it inevitably raises interregional trade barrier and local protection as China's local governments have strong incentives to maximize its local fiscal revenue. China's tax system further compounds the protection. China does not have sales tax for the majority of products and firms pay value-added taxes only at the production site. Due to the tax incentives, various levels of governments try to protect their firms to maintain the tax base (Bai et al., 2004; Huang et al., 2012). Taken together, the tax system and the fiscal decentralization lead to huge incentives for governments to protect their firms by directly or indirectly creating interregional trade cost (Young, 2000; Naughton, 2003). These have resulted in similar industrial structures across provinces and hindered the national efforts to realize the benefits of economies of scale.

Although the Central Chinese Government has enacted a series of regulations aiming to eliminate the discriminative measures toward non-local firms, local governments have used various underground measures, rather than to abolish these protective measures. These protective measures have caused market fragmentation in China, widely documented in a few studies (Young, 2000; Poncet, 2003; Bai et al., 2004; Xu and Fan, 2012). For example, Poncet (2003) finds that provincial border effects in China are as close as or higher than those among European countries or those between the United States and Canada. Bai et al. (2004) show that there are stronger incentives for local governments to protect their own industries and that local protectionism has an important effect on trade and specialization. However, unlike export market entry barriers, the underground hidden local protection measures in China are harder to quantify and detect[4].

Hence, for firms operating in China, there are two layers of costs associated with sales: they have to overcome domestic trade costs to break into other provincial markets, and they

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[4] Gilley (2001) and Li et al. (2003) have respectively reported cases in this regard. Gilley (2001) shows how Shenzhen's local government prohibits sales of newspaper from Guangzhou in order to protect its own local state-owned newspaper. Li et al. (2003) report that municipal government of Shanghai only allowed cars produced by its local joint venture firm with Volkswagen to operate in the taxi market.

have to be able to absorb international trade costs to become exporters. But, how large are the domestic trade barriers compared with the international trade barriers? It is hard to answer due to the fact that domestic trade costs are hidden measures. So the effect of the hidden costs to firms' sales behavior is an empirical investigation, which is what the paper aims to do. Specifically, the paper applies the heterogeneous firm theory to examine the effects of firms' productivity on their sales destinations both within China and in the international market, so that the results can shed light on the relative magnitude of the domestic trade costs. We apply Melitz's heterogeneous firm theory but extend it by grouping firms into several groups according to their sales destinations within their home provinces, outside their home provinces and in the international markets, and simultaneously study the effects of firms' productivity on their choice on sales destinations with a multinomial-logit model. This is different from the traditional approach by grouping all firms as exporters versus non-exporters and provides a nice niche to test the heterogeneous firm trade theory within and across a nation's border. We also control for firms' ownership heterogeneity and location heterogeneity, as commonly observed in China.

Using a detailed survey on firms' sales destinations for 2400 firms operating in China in 2003 by the World Bank, we find that, compared with firms with sales only in their home provinces, more productive firms not only self-select into sales in out-of-home provinces, but also into exporters, and the productivity effect for the latter is not significantly different from the former. We also find a local market effect in that firms entering other districts in their own home cities, or other cities in their home provinces do not need a higher productivity. There is some notable heterogeneity among foreign affiliates, state-owned enterprises (SOE), and private firms. In particular, for foreign affiliates, due to trade costs within China, those that sell to out-of-home province markets have the highest productivity.

The remainder of the paper is structured as follows. Section 2 describes the data, Section 3 discusses the estimation method, Section 4 reports the results, and Section 5 conducts some sensitivity analyses and Section 6 concludes.

2. Data Description

Data used here come from the World Bank Survey of 2400 firms operating in China in 2003. The survey was part of the World Bank's ongoing project of the World Business

Environment Survey. The randomly chosen 2400 firms located in 18 cities across 13 provinces in three regions: a third of the cities are in the west, a third in the middle and a third in the east.[5] The 2400 firms operate in 10 manufacturing and 4 service industries.[6] The survey collected firm information for year 2002, but some of the questions asked earlier data back to 1999. The surveyed firms include the whole spectrum of firm ownerships operating in China, of foreign-owned (FDI), state-owned (SOE) and collective/privately owned.[7]

For the purpose of the study, we group firms (exclusive between types) according to their sales destinations as the following: sales only in the city where firms operate (home city)—*CityFirm*; sales only outside the home city, but still within the same province (home province)—*OutCityFirm*; sales in many cities (including the home city) within the home province—*InProvFirm*; sales in other provinces, with or without sales in home province—*Domestic*; sales only in international markets—*Exporter*; and sales in domestic market and in international market—*AllSale*. The first three types are further grouped together as *ProvFirm* (the sum of *CityFirm*, *OutCityFirm* and *InProvFirm*) since they sell only within their home provinces. *Exporter* and *AllSale* firms are exporters, with a total of 521 firms, accounting for 21.7%, which is consistent with the previous literature that the majority of firms are non-exporters. Among the non-exporters, there are 813 *ProvFirm* firms that do not sell beyond their provincial borders, accounting for 33.9%. Finally, there are 1066 firms that have sales outside their home provinces, accounting for 44% (Table 1).

The key variable here is firms' productivity. Correctly measuring firm productivity is central to the main estimation results. However, firm productivity is not observable, and firms' input choices are subject to endogeneity, which ordinary least squares (OLS) could not correct.

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[5] The 6 coastal cities are: Benxi, Dalian, Hangzhou, Jiangmen, Shenzhen and Wenzhou. Cities in the middle of China: Changchun, Changsha, Harbin, Nanchang, Wuhan and Zhengzhou; and the 6 cities in the west are: Chongqing, Guiyang, Kunming, Lanzhou, Nanning and Xi'an.

[6] For manufacturing industries, 353 firms in apparel and leather products industry, 185 firms in electronics industry, 276 firms in parts of electronics industry, 63 firms in appliances, 358 firms in auto and parts industry, 71 firms in food industry, 66 firms in chemicals and medicine industry, 36 firms in bi-technology and Chinese medicine industry, 158 firms in iron and metal industry, and 50 firms in transportation industry, making it a total of 1616 manufacturing firms— or 67.3% in total. For service industries, there are 203 firms in information technology industry, 157 firms in accounting and financial services industry, 154 firms in advertising and sales, and 270 in commercial services, with a total of 784 service firms, or 32.7% of all firms.

[7] For the registered status, there are 59 publicly traded or listed companies, 313 non-publicly traded shareholding companies, 677 private, non-listed companies, 147 subsidiaries (division) of a domestic enterprise, 38 subsidiaries (division) of a multinational firm, 110 joint ventures of a domestic enterprise (domestic investment scheme), 145 joint ventures of a multinational firm (foreign investment scheme), 636 state owned companies, 387 cooperative/collectives, and 210 other types.

The recent development has used the Olley-Pakes method (Olley and Pakes, 1996) or the Levinshon-Petrin method (Levinshon and Petrin, 2003). We adopt the LP method as we have more data points on intermediate inputs, and use the following to estimate firm productivity:

$$ln(y_t) = \beta_0 + \beta_l ln(l_t) + \beta_k ln(k_t) + \beta_m ln(m_t) + (\omega_t + \delta_t) \tag{1}$$

Where t =2000, 2001 and 2002, y is sales revenue, l is the number of workers, and k is capital stock, proxied by firms' book values for fixed assets, m is intermediate inputs, proxied by total material costs, ω_t is firm's total factor productivity (TFP) and δ_t is a random error, which is not correlated with the input choices. Thus, the coefficients on the logarithm of labor, capital and intermediate inputs are their respective elasticities of sales revenue with respect to them. In order to ease the fluctuations of firms' productivity, we use the mean of productivity from 2000 to 2002 as the dependent variable in the later regressions. Table 1 gives the mean productivities for each firm type for comparison.

Although using LP method overcomes input endogeneity problem, it comes with a cost: it shrinks the number of firms from 2400 to 1615, due to missing values on intermediate inputs. In the empirical analysis, we also use the fixed effect method to calculate a new set of firm productivity for comparison. In the empirical investigation, we also include a host of firm-level factors to control other aspects of firm heterogeneity. They are described below.

FirmSize: measured as the logarithm of employment. Size is one of the most important factors behind firm heterogeneity (Bernard and Jensen, 1995). Large firms enjoy push-pull effects of market expansion. Larger firms have the economy of scale advantage that enables them to price their products low, leading to some competitive advantage in sales. Large firms are also motivated or even forced to expand aggressively to find markets for their products. Both will give them leverage over smaller firms in market expansion.

AD: firms' efforts to promote their products. In the information age, firms rely on different ways to promote their products, such as internet, newspapers, posters, magazines, TV and radio. The questionnaire asked whether firms use the above means to advertise their products, not on actual spending. We construct *AD* as the number of channels firms used. For instance, if a firm uses both TV and radio to advertise its product, *AD* is 2. If the firm does not use any of the channels, *AD* is 0.

Bamem: a 0/1 indicator on whether a firm is a member of an industry organization, with 1 yes, and 0 no. Being a member of an industry organization often enables firms to get access to

very valuable information on markets. In addition, industry association can coordinate and facilitate as a third party between firms and different levels of governments. We expect that being a member of an industry association helps firms enter other markets.

Age: years after birth. Age can have two competing effects. On the one hand, older firms are more experienced and have built up their intangible assets that help firms' sales expansion outside their home provinces. But, older firms also tend to be more conservative, and are harder to come out of their comfort zone. So whether *Age* has a significant effect on firms' choice on sales destinations is an empirical investigation.

In addition, we also include two ownership dummies of *SOE* and *FDI* to capture the effects of firm ownership structure on their probability to sell into other markets, compared with the base ownership type of collectively/privately owned. Similarly, we have location dummies to control for fixed location effects on firms' sales behavior. Table 2 reports the summary statistics for all the variables with their means, standard deviations, minimums and maximums. Clearly, the table indicates that there are widespread differences among firms, which highlights the fact that the sample is representative of firms operating in China.

3.　The Estimation Model

Since we are interested to examine the productivity effects on firms' multiple sales destinations, we rely on a model with multiple choices. Here, we model firms' choice of different sales destinations depending on the profits they derive from the corresponding sales. Let k denote firm types we discussed earlier. Since we are more concerned with trade costs across provincial and national borders, we group all firms with sales within their home provinces as one group (we later relax that to test the local market effects within provincial borders). We thus have $k = \{1,2,3,4\}$, with $k = 1$ for *ProvFirm* firms, $k = 2$ for *Domestic* firms, $k = 3$ for *Exporter* and $k = 4$ for *AllSale* firms. If a firm chooses a certain sale type j, profits derived from sale type j are higher than from any other sale types. That is:

$$\Pi^j(x_0, z) > \Pi^k(x_0, z), j \neq k, j, k \in \{1,2,3,4\} \tag{2}$$

Where Π indicates profits, depending on firm characteristics (x_0) and other factors (z). Let vector X include all covariates affecting a firm's profits, and ε be an idiosyncratic term, we assume that firms' profit take the form:

$$\Pi^k(x_0, z) = \beta'_k X + \varepsilon_k \tag{3}$$

We use the multinomial logit method (MNL), with $k = 1$ (*ProvFirm*) as the base category to model firms' choices on their sales destinations, that is:

$$P(K = k) = \frac{\exp(\beta'_k X)}{1 + \sum_{k=2}^{4} \exp(\beta'_k X)} \tag{4}$$

However, it is not straight forward to interpret the coefficients in the MNL model. Accordingly, we introduce the relative-risk ratios (rrr). For firm type *j*, the *rrr* for vector X, compared with the base category firm type 1 (*ProvFirm*), is derived as:

$$rrr_{j/1} = \frac{P(K = i|X + 1)/P(K = 1|X + 1)}{P(K = i|X)/P(K = 1|X)} \tag{5}$$

Interpretation of *rrr* is easier. Let's take the case for firms choosing type 2 (*k=2*) (*rrr₂/₁*) to illustrate the point. Compared with *ProvFirm*, one unit increase in X will lead to *rrr₂/₁* times increase in the relative probability for firms to become *k=2* type firms. Thus, the value of *rrr₂/₁* greater than unity indicates that increase in X leads to higher probability, and vice versa. For different firm types, *j*, *rrr_{j/1}* associated with each covariate reflects the marginal effects of the covariate on the probability of firms becoming type *j* firm.

As noted in the literature, the empirical application of the MNL model needs the assumption of Independence of Irrelevant Alternatives (IIA). The IIA assumption requires that the choice of any option does not affect the relative probability of other options. If it does not hold, one needs to use other estimation model specifications like multinomial probit model. In the empirical analysis, we use the Hausman test in Hausman and McFadden (1984) to test the IIA to show the validity of the assumption.

4. Estimation Results

4.1. The Baseline Results

Table 3 reports the baseline results. We take *ProvFirm* (firms with sales only in their home provinces) as the base firm type. Industry and the location dummies are included to control for industry and location fixed effects on firms' probability of becoming a specific firm type. We use both productivity measures in the regressions for comparison, but the results do not change

much. In what follows, we will focus on results from productivity measures derived from LP method only, and we now turn to discuss the results.

Productivity—The relative-risk ratios are significantly larger than one for all other firm types. Compared with the base type firms, increase in firms' productivity positively and significantly raises firms' probability of expanding sales into, respectively, other provincial markets (*Domestic*), international markets (*Exporter*) and both other provincial markets and international markets (*AllSale*). Statistical tests show that the coefficients on the three types of firms are not statistically different from each other. This leads to two conclusions. One, there is a strong self-selection effect that more productive firms choose to become exporters—for both *Exporter* and *AllSale* type firms. This is consistent with the predications of the heterogeneous firm theory and is complementary to many other findings in the literature like Bernard and Jensen (1995). Two, sales into other provinces *also* requires firms to be more productive—for *Domestic* firm type. This indicates that there exist entry barriers across provincial borders, in line with the "border effect" found in international trade literature. In other words, for a large developing transition economy as China, to apply the heterogeneous firm theory, we should consider not only the productivity difference between exporters and non-exporters, but also the remarkable heterogeneity within non-exporters.

FirmSize—Larger firms, in terms of employment size, are more likely to become a *Domestic* firm, or an *Exporter*, or an *AllSale* firm, given the significantly larger than one *rrr* value. The result might be driven by the fact that larger firms are more likely to commit resources for innovation, to enjoy economies of scale, and to have the embedded capabilities conducive for market expansion.[8]

Age—Age does not seem to be an important source leading to firms' choice on sales destinations. It might signal the cancelling out effects of experiences and conservativeness discussed earlier.

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[8] Firm size has a notable explanationary power on the choice of being *Allsale*. It's surprising to see in table 3 that the relative productivity advantage of *Allsale* is actually smaller than that of both *Domestic* and *Exporter*. Such estimation result is beyond our expectation that *allsale* should have the highest level of productivity since it has to face entry costs to both domestic and foreign markets. Such unexpected finding can be explained by firm size. It's easy to see that *Allsale*'s firm size is much larger than not only the baseline firm, but also *Domestic* and *Exporter*. Once we drop firm size in our estimation model, *Allsale* does have largest productivity advantage among the all four sale types. In other words, the market expansion of *Allsale* essentially shows the characteristics of scale economy.

AD—The value of *rrr* is significantly bigger than 1 for *Domestic* firm type and for *AllSale* firm type, but not so for *Exporter*. The result makes sense, as the advertisements are only circulated within China. They are thus effective for firms to expand their sales into other provinces within China (*Domestic* and *AllSale*), but not to become pure exporters (*Exporter*).

Bamem—Being a member of an industry association in China significantly increases a firm's probability to be *Domestic* or *AllSale* firm types, but not for *Exporter*, similar as the *AD* effects. An industry association within China can act as the intermediary between firms and various levels of governments to facilitate discussions of interests, and also disseminate market information among its members. These are often useful information for firms to enter other provincial markets.

SOE—Being state-owned does not give firms a higher probability to sell in other provincial markets, nor to export to the international market. In fact, SOEs have lower probability of becoming exporters, *ceteris paribus*.

FDI—Being foreign-owned significantly increases the probability for firms to become exporters, but not so for selling into other provincial markets, as evidenced by the positive (larger than 1) and significant coefficients on *Exporters* and *AllSale* firms, but not on *Domestic* firms. The much larger coefficients reflect higher tendency to export for FDI affiliates in China.

4.2. Local Market Effects

So far, we have focused on the entry barriers across provincial borders and the national borders, and have found the so-called border effect across provincial borders. That is, we assume that the market within a province is borderless. If that is indeed the case, within a province, we would expect no productivity premium attached to firms selling into other cities in their home provinces—the so-called local market effect. The investigation of local market effect would help us understand to what extent China's domestic market is fragmented. The finer classification of firms in Table 1 provides us a chance of testing the local market effect phenomenon. To do that, we use the *CityFirm* group as the base category, with the results reported in Table 4.

Even with two different productivity measures, we obtain similar results. Increases in productivity do not affect firms' probability to choose *OutCityFirm* or *InProvFirm* firms. In contrast, increases in productivity significantly raise firms' probability to choose *Domestic*,

Exporter and *AllSale* types respectively. In sum, our results are consistent with the heterogeneous firm theory in international trade, with Chinese characteristics. The results suggest that a province in China acts as a "country", sales within a province does not incur the "border" effect, however, sales outside the province incur additional costs and thus requires a higher productivity premium, with similar magnitude as that for international sales.

4.3. The Extent of Provincial Entry Barriers

Unlike in international trade where at the least tariff rate could be used to quantify export barriers, for Chinese domestic trade, there are no explicit entry barriers across the provincial borders, despite their existence. If firms do not experience discriminate measures when they enter other provincial markets, would there still be a border effect in place? In the survey, firms are asked whether they have experienced entry barriers when they enter other provincial markets. Some firms say they experienced some (strong—107 firms or weak—110 firms), others answered none (849 firms). [9] This provides a rare opportunity for us to test the differential productivity effects on *Domestic* firms with different experiences on entry barriers across provincial markets. If there is no persistent presence of protection favoring local firms, productivity effects should not be as important for those firms that do not feel the obstacle of market entry into other provinces. To do so, we split the *Domestic* firm group into those that experienced "No", "Weak" or "Strong" obstacles, and rerun the regression, still with *ProvFirm* as the base type. The estimation results are reported parallel in Table 5.

Clearly, regardless of whether firms experienced the obstacle of entry barriers or not, or how much, increases in productivity lead to higher probability for firms to choose to enter other provincial markets. In fact, the coefficients are not statistically different from each other, which implies that entry barriers are permeated even if a firm does not feel it.

The analogy for the above analysis would be to see whether the opposite holds for *ProvFirm* groups. For the same question, Out of the 79 *OutCityFirm* firms, 19 firms said they experienced market entry barrier and 60 answered "no". Among the 318 *InProvFirm* firms that sell in their home province, 56 firms answered "yes" and 262 answered "no". If the borderless

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[9] One weakness of this indicator lies in that it's hard to compare the answers of different firms since they are surveyed individually. For example, we can't conclude that one firm who answers "strong" does really experience stronger interregional market protection than the other who answers "weak". However, given the fact that it's very hard to observe and measure interregional trade barrier, it's still useful to such surveyed information to examine the effect of domestic trade cost on firms' sale behavior.

assumption is true within a province, then productivity premium should not be important even for firms that experienced entry barriers with sales only within their home provinces. We re-estimate our model with *CityFirm* as the base group, and the corresponding results fail to show a significant productivity effect for *OutCityFirm* and *InProvFirm* firms, regardless of their answers. Such results indicate that there are little or no trade barriers within a province.

5. Some Sensitivity Analyses

5.1. Firm Ownership

The survey includes all ownership types of firms as state-owned, foreign-owned, and private and collectively owned. Firms from all three ownership types had sales in other provincial markets and/or exports (Table 6). In the previous analysis, we assume that ownership dummies *SOE* and *FDI* can respectively capture the differences between SOE and FDI firms with the base ownership firms (collectively/private-owned), *ceteris paribus*. However, that assumption might be strong as there might be some covariates whose effects are ownership specific. Additionally, it's well known that firms' export behavior and trade patterns significantly vary with their ownership structure in China (Manova and Zhang, 2011). Here, we relax that assumption and run the regression separately for state-owned, FDI-controlled and collectively/private-controlled firms to see whether the covariates generate systematic differences for different ownership types, with the newly obtained results recorded in Table 7. We focus on the effects of productivity and discuss for all three ownership types in turn below.

FDI—foreign controlled firms exhibited an interesting pattern different from the pooled results. For them, increases in productivity significantly improve their chances of becoming *Domestic* or *AllSale* firm types, but not so for *Exporter* type, though FDI-controlled firms as a group have a much higher tendency to become exporters. The result is not so surprising given FDI's operations in China. Foreign firms in China have two major types: targeting overseas consumers (export-oriented firms—pure exporters) and serving Chinese consumers (with or without exports). For pure exporters (*Exporter*), they are part of the parent firms' production chain, and production in China solely serves their overseas consumers. For the more general types of foreign affiliates in China, they can either use the existing sales channels of their parent firms to export overseas, or their parent firms will be in charge of the overseas sales. Either way will give foreign affiliates many advantages in exporting. However, sale within

China is a different story. Foreign affiliates have to recruit sales personnel, build up their sales channels in China, and have to adapt to the Chinese business culture and the Chinese law. Even with sales channels in place, due to the large (hidden) protective measures, it is costly for those foreign firms to expand into other provinces. To a large degree, sales into other provincial markets for foreign affiliates is equivalent as sales into the international market for domestic firms, and thus is an indirect application of the Melitz's heterogeneous firm theory. Within that context, it is not surprising that, for foreign affiliates, productivity increases significantly raise their chances to sell in other provincial markets, not so for exports.

Thus, splitting FDI firms into different sales groups effectively delineate the Chinese characteristics of FDI firms and the regional barriers. Our empirical results also help understand the puzzling finding of productivity paradox for the exporters of foreign affiliates by Lu et al. (2009). The existence of interregional trade barriers within China is the main source of such paradox, and the findings here are consistent with the spirits of Melitz's theory.[10]

SOE—state-owned firms are an interesting category in China, as they are often found to be the least efficient producers. The result here shows that productivity increases do not seem to increase their chances for sales neither in the domestic market, nor in the international market. In fact, being state-owned decreases firms' chances to become exporters. Although it has been widely reported that China's SOEs are less efficient and less productive, but at the same time, they might have access to some favorable treatments such as easy bank loan from the state-owned banks (Hovey and Naughton, 2007). Such policy supports might help SOEs overcome some of the market entry costs within China even with lower productivity. For exports, however, these supports are not enough, and SOEs' export share has been slipping annually, picked up by private firms.

Private/Collective Firms—this type of firms are the typical firms modeled in Melitz's theory: they do not enjoy the overseas sale channels as foreign firms, nor the other resources like SOEs. Compared with the base type firms, increases in productivity significantly raise their chances to sell not only in other provincial markets, but also in international market. The

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[10] We also take a robustness test by using all the firms who only sell in China's domestic market as the baseline type, i.e., we combine *ProvFirm* and *Domestic* together as the new baseline type. The new estimation result shows that there is actually no such productivity paradox, since the estimated coefficient of pure exporters' productivity fails to show statistical significance.

coefficients between *Domestic* and *AllSale* firms are not statistically significant from each other, but the coefficient for *Exporter* is significantly larger. The results confirm our hypothesis that sales into other provincial markets, just as exporting to international markets, incur additional costs due to trade barriers and transportation costs, and thus a productivity premium is required to offset these costs. The higher productivity effects to become exporters than to become multi-provincial market domestic firm signal that international trade costs are higher than the provincial trade costs.

5.2. Location Heterogeneity

One of the other strong Chinese characteristics is the policy-lead regional uneven developments. Since 1978, the economic reforms and the associated favorable policies were first carried out in the coastal regions, then to eastern provinces and finally (and gradually) to inland areas. The coastal areas have been developing at an astonishing pace, and have become China's exporting and production center. Coastal regions have well-developed infrastructure and port facilities; inland areas have caught up to some extent, but the development disparity is still very large. Firms locating in the coastal areas will enjoy the location advantages especially in exporting. Although it is customary and convenient to include regional dummies to control for regional disparity, it has constraints, because it assumes all firms located in the same region could equally take advantage of the benefits the region offers. But, given the inherent differences among the different ownership types, we relax that assumption here to examine the productivity effects on firms' sales destinations by region, like some of the previous studies have done regarding the Chinese economy. We group firms into three locations: East, Coast and Inland. Among the total 2400 firms, 500 are in Coastal cities, 900 firms locate in the Eastern provinces and the remaining 1500 firms are in Inland areas. Table 8 reports the corresponding results.

Coast—Firms located in the Coastal area show up different results from the pooled sample. Productivity significantly increases firms' chances to serve domestic markets only. For firms with exports (*Exporter* and *AllSale* types), productivity increases are not sensitive to their sales entry in the international market. This might be due to the fact that transportation costs are relatively low for the exporting firms in the Coast, but selling into inland provinces incurs not only the transportation costs but also the protective measures by other provinces.

East—Firms located in the East exhibit the similar pattern as the pooled sample. Productivity increases significantly and positively affect firms' probabilities of selling in other provincial markets or in the international markets. Further test statistics indicate that the coefficients for the three types of firms are not significantly different from each other.

Inland—The results for firms in the Inland area reinforce our main message that higher productivity help overcome the entry barriers, both across provincial borders and across national borders. Increase in productivity leads to significant increase in probability for firms to become exporters, and to sell in other provincial markets. The productivity premium for firms to become exporters is the highest, signaling the fact that productivity increase is very sensitive to firms' desire for exports, and the higher transportation costs.

5.3. Alternative Measures for Firms' Sale Behavior

So far, we have group firms based on whether they had sales in a particular location, not the volume in each market. But *AllSale* firms have both exports and domestic sales, knowing the percentage of their sales in home and international markets would help us understand better firms' multi-destination decision. To that end, we use a fractional multinomial logit model (fractional MNL), proposed by Papke and Wooldridge (1996), to investigate the effect of productivity on firms' sales pattern with their sales shares in each destination. For each firm, we calculate their sales shares in their home city, in other cities in their home provinces (excludes home city), in other provinces, and for exports. The sum of all the shares is 100%. For instance, for *Exporter* firms, the export share is 100%, all others are 0%. We estimate the model for the pooled sample, and also for the three ownership types separately, with both measures of productivity. Table 9 gives the results, which we discuss below.

First, for the pooled sample, increases in productivity significantly improve firms' sales in other provincial markets, and in the international market (exports). Such results are consistent with those shown in table 3. It means that our main findings are robust. Second, for different firm ownership types, productivity increases in FDI controlled firms significantly raises their sales shares in the domestic market. For private/collectively owned firms, increases in productivity lead to increased sales shares in both the domestic markets and also in international markets. SOEs are insensitive to productivity changes. The results here are consistent with the previous ones.

6.   Conclusions

Productivity premiums associated with exporters have been well-documented in the trade literature. However, little is known whether there is a productivity premium attached with firms that have sales outside their home provinces if there are substantial entry barriers. The effects of trading costs within a country's border can partially be offset by firms' familiarity with other provinces in China, thanks to the same culture and same business environment. Thus, to what extent domestic trade costs affect firms' sales behavior is unknown, especially compared with exporting firms. This paper uses a World Bank survey of 2400 firms operating in China to examine the productivity effects on firms' sales into other provincial markets, and in the international market, and the results can shed light on the magnitude of domestic relative to international trade costs China's firms face. China offers an interesting case, as there are large entry barriers across provincial borders, and there are huge firm heterogeneity arising from firm ownership and firm location. To better capture the effects of productivity on firms' decision to sell in out-of-home provincial and international markets, we group firms with sales only in their home provinces, with sales in other provinces, with only exports, with both exports and domestic sales. This finer differentiation would allow us a rare opportunity to apply the heterogeneity firm theory both within a country and in the international market.

We find that productivity increases significantly raise firms' probability to sell in other provinces and to sell in the international market. However, for FDI controlled firms, productivity is not sensitive to their decision for exports, but generates significant positive effects on their domestic sales. For state-controlled firms, productivity does not seem to affect their probability to either sell in other provinces, or in international market.

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Table 1: Summary of Firm Types by Sale Destinations and Their Mean Productivity

Firm Type by Sale Destinations			Definition	No. firms	share (%)	Mean of lnTFP_LP	Mean of lnTFP_fe
Firms with no exports		CityFirm	Sales only in the home city where the firm locates	416	17.33	3.069	-0.442
	ProvFirm	OutCityFirm	No sales in home city, but sales in other cities in home province.	79	3.29	3.058	-0.424
		InProvFirm	Sales in home city and in other cities in home province	318	13.25	3.054	-0.459
	Domestic		Sales in other provinces, with or without sales in firms' home province	1066	44.41	3.443	0.059
Firms with exports	Exporter		Exports only (no domestic sales)	99	4.13	3.673	0.310
	AllSale		Exports plus domestic sales	422	17.58	3.697	0.403
Total				2400	100		

Note: summarized over firms' sale destinations.

Table 2: Summary Statistics of the Main Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
lnTFP	1615	3.524	0.963	-1.815	9.386
FirmSize	2396	4.836	1.512	0.000	11.303
Ad	2400	1.435	1.637	0.000	6.000
Bamem	2379	0.583	0.493	0.000	1.000
Age	2400	14.986	14.390	2.000	52.000
Certification	2400	0.484	0.500	0.000	1.000

Table 3: Baseline Results

variables	(1) Domestic		(2) Exporter		(3) AllSale	
lnTFP-LP	1.342*** (0.135)		1.612** (0.393)		1.324** (0.172)	
lnTFP-FE		1.359*** (0.133)		1.578** (0.371)		1.372*** (0.172)
FirmSize	1.340*** (0.092)	1.284*** (0.094)	2.214*** (0.365)	2.102*** (0.372)	1.763*** (0.149)	1.677*** (0.153)
Age	0.999 (0.006)	0.999 (0.006)	0.972 (0.018)	0.972 (0.018)	0.981** (0.008)	0.981*** (0.008)
AD	1.067*** (0.029)	1.067*** (0.029)	0.932 (0.079)	0.933** (0.079)	1.069** (0.034)	1.069** (0.034)
Bamem	1.445*** (0.220)	1.435*** (0.219)	0.808 (0.287)	0.802 (0.285)	2.021*** (0.408)	2.003*** (0.405)
SOE	0.852 (0.166)	0.834 (0.163)	0.239* (0.195)	0.233* (0.190)	0.833 (0.211)	0.818 (0.207)
FDI	1.699 (0.623)	1.649 (0.606)	13.57*** (7.446)	13.11*** (7.201)	3.728*** (1.463)	3.591*** (1.412)
Industry dummy	yes	yes	yes	yes	yes	yes
City dummy	yes	yes	yes	yes	yes	yes
Sample:			1525			

Note: ***, ** and * denote 1%, 5% and 10% significance level respectively. The regression includes all other firm-level control variables, not reported due to space limitations.

Table 4: Local Market Effects

	OutCity	WithinProv	Domestic	Exporter	AllSale
lnTFP_LP	1.233	0.992	1.386***	1.664**	1.366*
	(0.351)	(0.160)	(0.184)	(0.432)	(0.214)
lnTFP_FE	1.373	1.009	1.428***	1.657**	1.442**
	(0.378)	(0.159)	(0.185)	(0.416)	(0.218)

Note: ***, ** and * denote 1%, 5% and 10% significance level respectively. The regression includes all other firm-level control variables, not reported due to space limitations. Regression includes all other covariates, but results are omitted here for brevity.

Table 5: Presence of Local Market Protection

	Domestic (Answered No Obstacles)-	Domestic (Answered WEAK Obstacles)-	Domestic (Answered STRONG Obstacles)-	Exporter	Allsale
lntfp_lp	1.323***	1.451**	1.40*	1.612**	1.325**
	(0.138)	(0.276)	(0.255)	(0.393)	(0.172)
lntfp_fe	1.350***	1.396*	1.407**	1.579**	1.374***
	(0.137)	(0.260)	(0.247)	(0.371)	(0.172)
sample	849	110	107	99	422

Note: ***, ** and * denote 1, 5 and 10% significance level respectively. The regression includes all other firm-level control variables, not reported due to space limitations.

Table 6: Number of Firms across ownership and sales destinations

Ownership	No. of firms	*ProvFirm*	*Domestic*	*Exporter*	*AllSale*
FDI	166	14 (8.43%)	66 (39.76%)	25 (15.06%)	61 (36.75%)
SOE	636	226 (35.53%)	298 (46.86%)	3 (0.47%)	109 (17.14%)
Private/Collective	1598	573 (35.86%)	702 (43.93%)	71 (4.44%)	252 (15.77%)

Table 7: Firm Ownership Heterogeneity

		(1)	(2)	(3)
		Domestic	*Exporters*	*AllSale*
FDI	lnTFP_LP	4.736** (3.477)	1.264 (1.012)	4.669** (3.412)
	lnTFP_FE	4.212** (2.794)	0.942 (0.698)	4.282** (2.831)
SOE	lnTFP_LP	1.214 (0.235)	0.133 (0.269)	1.369 (0.341)
	lnTFP_FE	1.221 (0.228)	0.073 (0.155)	1.408 (0.338)
Collective/Private	lnTFP_LP	1.555*** (0.183)	2.788*** (0.761)	1.558*** (0.250)
	lnTFP_FE	1.601*** (0.183)	2.725*** (0.715)	1.634*** (0.253)

Note: ***, ** and * denote 1%, 5% and 10% significance level respectively. The regression includes all other firm-level control variables, not reported due to space limitations.

Table 8: Location Heterogeneity

		(1)	(2)	(3)
		Domestic	*Exporters*	*AllSale*
East	lnTFP_LP	1.543***	1.749*	1.466*
		(0.273)	(0.533)	(0.309)
	lnTFP_FE	1.519***	1.649*	1.480**
		(0.257)	(0.484)	(0.297)
	observations	350	56	200
Coast	lnTFP_LP	1.374*	1.257	1.038
		(0.248)	(1.589)	(0.263)
	lnTFP_FE	1.398**	1.014	1.122
		(0.246)	(1.223)	(0.272)
	observations	124	54	125
Inland	lnTFP_LP	1.481***	2.291***	1.563***
		(0.178)	(0.693)	(0.249)
	lnTFP_FE	1.527***	2.268***	1.639***
		(0.179)	(0.664)	(0.254)
	observations	716	43	222

Note: ***, ** and * denote 1%, 5% and 10% significance level respectively. The regression includes all other firm-level control variables, not reported due to space limitations.

Table 9: Multinomial Logit Estimation with Sale Shares

		city	province	domestic	export
Pooled	lnTFP_LP	-0.039(0.084)	-0.024(0.087)	0.191**(0.087)	0.235**(0.122)
	lnTFP_FE	-0.021(0.084)	0.002(0.087)	0.231***(0.087)	0.228**(0.118)
FDI	lnTFP_LP	-0.201(0.315)	0.040(0.283)	0.231*(0.087)	0.228(0.118)
	lnTFP_FE	-0.210(0.284)	0.067(0.244)	0.387*(0.208)	0.095(0.263)
SOE	lnTFP_LP	-0.064(0.142)	-0.092(0.178)	-0.018(0.163)	-0.144(0.202)
	lnTFP_FE	-0.007(0.138)	-0.033(0.176)	0.032(0.156)	-0.150(0.209)
Private	lnTFP_LP	-0.031(0.109)	0.003(0.108)	0.204*(0.115)	0.349**(0.160)
	lnTFP_FE	-0.018(0.110)	0.025(0.109)	0.252**(0.115)	0.360**(0.156)

Note: ***, ** and * denote 1%, 5% and 10% significance level respectively. The regression includes all other firm-level control variables, not reported due to space limitations.